



A COMPARATIVE ANALYSIS OF EFFECT OF VARIATION IN DAILY TEMPERATURES ON COVID 19 ASSOCIATED MORTALITY IN WORST AFFECTED REGIONS ACROSS THE GLOBE.

Epidemiology

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ABSTRACT

Background: With 416,686 confirmed cases and 18,589 deaths over three months, COVID 19 is one of most menacing pandemic of recent times. The causative agent, SARS-CoV-2 causes moderate to severe lower respiratory tract infection depending on the age, comorbidity and geographical location.

Purpose: This study was done to compare and analyze the effect of average daily temperatures on the severity of the disease in terms of daily new deaths in worst hit regions. The study was also aimed to find out if there was any preferred temperature for epidemic to escalate.

Method: The severity of disease was assessed in terms of daily new deaths which was charted against variation of average temperature of same day.

Result: It was recorded that there was sharp descent in average daily temperature almost every time before rise and during peak of the deaths. It was also found that elevation in temperature curve was followed by decrease in daily deaths, suggestive of decrease virulence of virus at higher temperatures.

Conclusion: Based on data evaluation, there was variation in daily deaths counts with change in average daily temperature which is suggestive of higher virulence of SARS CoV -2 at lower temperatures and vice versa.

KEYWORDS

INTRODUCTION:

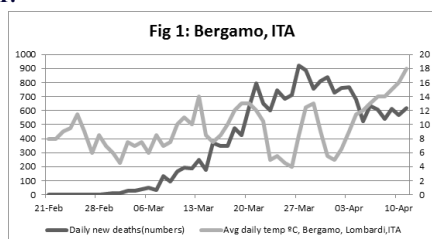
The world is going through one of the most dreadful pandemic of recent times which now is officially declared by The World Health Organization (WHO) as a Public Health Emergency of International Concern [1]. The causative agent is confirmed as 2019 novel coronavirus which was first reported from Wuhan, Hubei Province, China in December 2019 from severe lower respiratory tract infection patients. [2,3,4]. The agent is named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the disease as 2019 novel coronavirus disease (COVID-19) [4,5]. With 416,686 confirmed cases and 18,589 death as of 25 March 2020, worst hit regions are Italy, Spain China, Iran and US [6]

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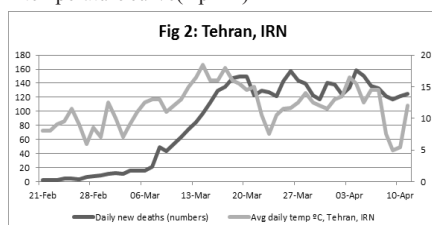
METHOD:

The severity of disease was assessed in terms of daily new deaths from first death till 10 April, for which data was collected.[7]. The number of death was charted against average of maximum and minimum temperature on the same day [8] and assessed.

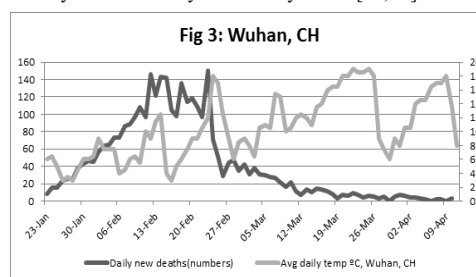
RESULT:



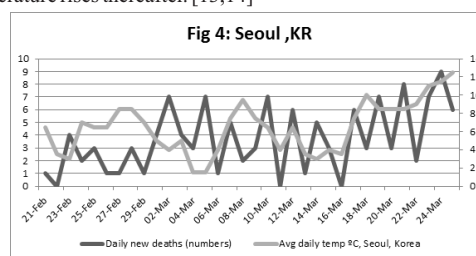
Beginning with the worst hit region Italy[9,10], the graph in fig 1 shows dip in temperature curve (March 2) immediate before escalation in mortality and again (March 16, March 24 and March 31) just before increase in daily deaths. Decrease in number of death was recorded after rise in temperature curve (April 4)



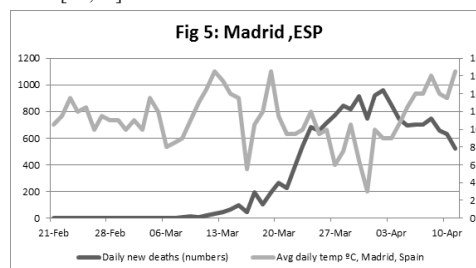
In Tehran (Fig 2) also there were initial dips in average temperature curve on March 4, March 10 and March 25 before rise in daily mortality curve. Also there is decline in temperature curve near April 10 which may be followed by rise in daily death. [11,12]



Wuhan (Fig 3), also recorded drop in average daily temperature during Jan 26, Feb 6 and Feb 16 all of them corresponding to high death curve. Also there is decrease in mortality after Feb 28 as the average temperature rises thereafter. [13,14]

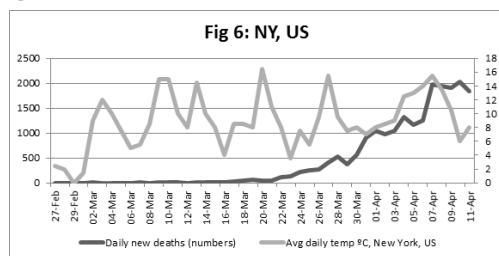


In Seoul (Fig 4), although there is no apparent relation between curves maybe because of less daily death in comparison to other countries. Still persistent rise in temperature during Feb 25-29 has recorded dip in death curve. [15,16]



Madrid (Fig 5) which has recorded maximum deaths in Spain also shows decrease in temperature curve at beginning (Mar 16) and before peak of death curve (Mar 22 and April 1). The mortality curve was

lowered after April 3 when average temperature rises above 12 °C [17,18]



In New York (Fig6) dip in temperature curve was recorded before rise of mortality curve (Mar 16) and immediately before exponential rise in deaths (Mar 28-31). Also there is recent fall in average temperature (Apr 10) where mortality curve can rise. [19,20]

DISCUSSION:

Purpose of this study was to find out effect of average daily temperature on the severity of COVID 19 in terms of daily mortality. The aim was to relate why warmer regions were recording less severe form of disease while US and Europe is worst affected [21]. Although previous studies for instance, K. H. Chan et al have already related better stability of SARS-CoV-1 at low temperature and low humidity. [22]. But less data was found regarding SARS-CoV-2.

In this study, it was observed that the average daily temperature in every region was recorded below 10 °C immediately before the initial acceleration of death curve, which might link higher virulence of the virus at low temperature.

We also recorded sharp descent in average daily temperature almost every time before rise and during peak of the daily death curve. It was also found that rise in temperature curve was followed by decrease in daily deaths, suggestive of less virulence at higher temperatures. This inverse relationship might be one of the reason why warm countries (India, Bangladesh) which are although more crowded with poor quarantine and health services have recorded less deaths. If this is the reason then the countries with cooler climate (2-8 °C average temperature) are at higher risk in terms of number of critical infections and deaths.

Thus, exposure to higher temperature (above 30°C average temperature) might be of some help in reducing the risk of transmission of virus at home or hospitals surroundings and could help in reducing disease complications in already infected.

Further studies relating virulence, infectivity and viral replication rate to temperature changes would be helpful.

CONCLUSION:

Based on data evaluation, there was variation in daily deaths counts with change in average daily temperature which is suggestive of higher virulence of SARS CoV -2 at lower temperatures and vice versa.

Conflict of Interest: None

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